

What we know:

How to solve for unknown angles and sides in a triangle if there is a RIGHT ANGLE.
SOH CAH TOA

How to solve for unknown angles and sides if there is NO RIGHT ANGLE, but you have a "pair".
The Sine Law

What we need to know:

How to solve for unknown sides and angles in an acute triangle:
 a triangle **WITHOUT A RIGHT ANGLE and WITHOUT A "PAIR"**.

Cosine Law

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8.3/8.4

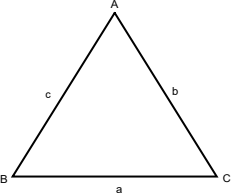
The Cosine Law

When do you use the Cosine Law?

- ★ NO right angle in the triangle.
- ★ You are given 2 sides and an angle that is the contained angle.
- ★ You are given 3 sides and NO angles.

What does this mean?
 You **DO NOT** have "pair" of angle and opposite side.

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$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

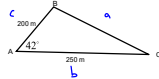
Ex. #1: Write the cosine law for **f** in triangle EFG.

$$f^2 = e^2 + g^2 - 2eg \cos F$$

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Ex. #2: Solve $\triangle ABC$.

Find all angles and all side measures.



Do you see a "pair"?
 If not, then there is not enough info to use the Sine Law.

Find "a" using the cosine law:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Find "B" using the sine law:

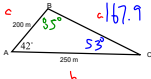
The sine law is easier, so use it as soon as you have a "pair". Notice that now you have A and a.

Find "C" using the Angle Sum of a Triangle Theorem:

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Ex. #2: Solve $\triangle ABC$.

Find all angles and all side measures.



Do you see a "pair"?
 If not, then there is not enough info to use the Sine Law.

Find "a" using the cosine law:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 250^2 + 200^2 - 2(250)(200) \cos 42^\circ$$

$$a^2 = 62500 + 40000 - 100000(0.7431)$$

$$a^2 = 102500 - 74310$$

$$a^2 = 28190$$

$$a = 167.9$$

Find "B" using the sine law:

$$\frac{\sin 42^\circ}{167.9} = \frac{\sin B}{250}$$

$$\sin 42^\circ (250) = \sin B (167.9)$$

$$\frac{0.6691(250)}{167.9} = \sin B$$

$$0.9963 = \sin B$$

$$\sin^{-1}(0.9963) = B$$

Find "C" using the Angle Sum of a Triangle Theorem:

Sum of $\angle A + \angle B$

$\angle C = 95^\circ$

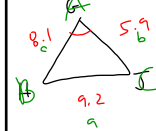
The sine law is easier, so use it as soon as you have a "pair". Notice that now you have A and a.

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Ex. #3: In $\triangle GHJ$, GH is 8.1 cm, HJ is 9.2 cm, and GJ is 5.9 cm. Calculate the measure of angle G to 2 decimal places. (nearest degree)

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Ex. #3: In $\triangle GHJ$, GH is 8.1 cm, HJ is 9.2 cm, and GJ is 5.9 cm. Calculate the measure of angle G to 2 decimal places.



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$(9.2)^2 = (8.1)^2 + (5.9)^2 - 2(8.1)(5.9) \cos A$$

$$84.64 = 65.61 + 34.81 - 95.58 \cos A$$

$$84.64 = 100.42 - 95.58 \cos A$$

$$84.64 - 100.42 = -95.58 \cos A$$

$$-15.78 = -95.58 \cos A$$

$$\frac{-15.78}{-95.58} = \cos A$$

$$+ (0.1653) = \cos A$$

$$\cos^{-1}(0.1653) = A$$

$$90 = A$$

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Homework

Pg. 443 # 3, 4, 5d, 6, 9, 10a, 11, 13

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